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Evaluation of Hematological and Urine Parameters in *Hemiscorpius lepturus* (Gadim) Victims Referred to Razi Hospital, Ahwaz, Iran

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The aim of this study was to evaluate the effect of venom *H. lepturus* on hematological changes and renal failure. Results of this study will help us in quick diagnosis and treatment of scorpion stinging and decreasing the mortality. In total 119 patients were studied. Various blood parameters such as hemoglobin (Hb), Red Blood Cell (RBC) count, Prothrombin Time (PT) and Partial Prothrombin Time (PTT) and also urine parameters were measured. The highest number of victims was in age group of 20-29 years old. Hb was less than 12 g dL⁻¹ in 54% of patients. The RBC count was 4.6 millions mm⁻³ in 48.73% of victims. PT in 61.4% of patients was more than 13 and it showed that there is a significant difference with the other group of stung victims (p = 0.001). PTT test in 43.7% of patients was normal. Severe hemoglobinuria was shown in 61.6% of *H. lepturus* stung victims, but 38.4% had a mild hemoglobinuria. 43.1 and 57% of patients had mild and severe hematuria, respectively. The results have been explained on the basis of damages to structures such as erythrocytes, coagulation factors and capillary system of glomeruli.

Key words: *H. lepturus*, hematological parameters, hematuria, PT, PTT

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INTRODUCTION

Scorpion stinging is one of the major cause of mortality in the tropical and sub-tropical countries (Elston, 2005). Hundreds of people are stung annually by scorpions in various semi-arid and arid areas in developing countries with large rural populations (WHO, 1985). Epidemiological studies on scorpion stinging have been conducted in several countries, such as Tunisia (Goyfflon *et al.*, 1982), Algeria (Warrell, 1987), Iran (Radmanesh, 1990a), Brazil (Lourenco and Cuellar, 1995; Lira-da-Silva and Amorim, 2000), Morocco (Touloun *et al.*, 2001), Saudi Arabia (Neale, 1990; Al-Sadoon and Jarrar, 2003), Mexico (Chowell *et al.*, 2006) and Turkey (Adiguzel *et al.*, 2007). The highest mortality, with over 1000 deaths per year, has been reported in Mexico (Chowell *et al.*, 2005). Most stung victims by scorpion are in hot seasons and it happens in winter rarely (Goyfflon *et al.*, 1982; Al-Sadoon and Jarrar, 1994). It has been shown that most scorpion sting victims are male and preponderance of male sex has been approved in Brazil (Lira-da-Silva and Amorim, 2000).

About 800 species of scorpion's families in the entire world has been reported. The major family, which is important from the view point of clinical, is Buthidae family, which is the most poisonous species (Keegan, 1980; Murthy and Zara, 2001). In Khuzestan province, located at southern west of country, *Hemiscorpion (Hemiscorpius) lepturus* is the problem. Native people called it Gadim. Around 10-20% of scorpion stinging is happened by this scorpion and about 95% of death due to scorpion stinging is related to that (Radmanesh, 1998; Kobra, 2000).

Biological effects of poison of each scorpion are specific and depend on its species (Mebs, 2006). It has been shown that a poison of one of the species of Butidea family caused hematological disorder in experimental animals such as decreased in the value of platelets, fibrinogen and also cause deficiency in coagulation factors such as V, VII, VIII, XIII and increased RBC osmotic fragility (Murthy and Zolfagharian, 1986a, b). In *Androctenus cassiduo*, some symptoms such as severe pain, effect on CNS, effect on muscular actions and even death have been reported (Radmanesh, 1990b). Hemoglobinuria, mild to severe also has been reported as an effect of scorpion stinging (Radmanesh, 1990c). A novel toxin, named hemicalcin has been recently purified from the venom of the *Hemiscorpius lepturus*. It is a 33-mer basic peptide and it is a new biologically active toxin that belongs to a family of peptides active on ryanodine-sensitive calcium channels (Shahbazzadeh *et al.*, 2007). Venom of the type of

Hemiscorpius lepturus affects more on CNS, cardiovascular, skin and blood cells (Radmanesh, 1990a). Gadim venom can cause severe hemolysis of the red blood cells, disorder in blood vessel system, as well as disorder in heart pumping and its rhythm and also it causes acute lung insufficiency. Hemoglobinuria, mild to severe, also has been reported as an effect of scorpion stinging (Radmanesh, 1990c).

In present research, effects of Gadim venom on blood and urine in stung persons who referred to the Razi hospital, Ahwaz, Iran, were studied. Results of this study will help us in quick diagnosis and treatment of scorpion stinging and decreasing the mortality. On other hand, biomedical effects of peptides from invertebrate venoms, including scorpions, have attracted interest as a potential source of bioactive substances, especially neurotoxins. These molecules contributed to the design of novel drugs for the treatment of neurological disorders and pain (Mortari *et al.*, 2007).

MATERIALS AND METHODS

In total 119 scorpion stung patients, including 56 male and 63 female who referred to Razi Hospital, Ahwaz, Iran, were medically investigated on the basis of age and sex. Hematological tests such as Hb, RBC count, PTT and PT and also hemoglobinuria and hematuria were done. Hb, Hematocrit (Hct) and RBC count were evaluated by cell counter Micros 60. Prothrombin Time (PT) and Partial Thromboplastin Time (PTT) were measured by Biomerkit kit. Hemoglobinuria and hematuria were observed via strip (Combi. Scrin9) and microscopic examination.

For data analysis, the statistical software SPSS 11.5 was used. The method comparing Proportion was applied by Z-test with $\alpha = 0.05\%$ significance level. Bio- medical ethics laws were considered in all steps.

RESULTS AND DISCUSSION

Patients were in the age limitation of 10-70 years old. They were divided into 6 groups. The number of female and male were 63 (52.94%) and 56 (47%), respectively.

The highest percentage in age of scorpion stinging (36.13%) was related to age group 20-29 years old, meanwhile the lowest percentage (2.52%) was related to age group 60-70 years old, which was comprised of three patients (2.52%). The highest percentage in female and male victims both were related to age group of 20-29 years old with 19.32% and 16.30% respectively (Table 1). The highest rate of blood change in scorpion stung people was related to PT with 61.4% (Table 2). Statistically analyze showed a significant difference among normal and abnormal PT in scorpion stung persons ($p = 0.001$).

Table 1: Prevalence of Gadim victims in relation to age and sex

Age group (year)	Male No. (%)	Female No. (%)	Total No. (%)
10-19	14(11.67)	12(10.08)	26(21.84)
20-29	20(16.30)	23(19.32)	43(36.13)
30-30	11(9.24)	10(8.40)	21(17.64)
40-49	8(6.72)	13(10.92)	21(17.64)
50-59	2(1.68)	3(2.52)	5(4.20)
60-70	1(0.80)	2(1.68)	3(2.52)
Total	56(47.05)	63(52.94)	119(100.00)

Table 2: Prevalence of blood parameter changes in Gadim stinging patients according to sex

Sex	Hb (gr dL ⁻¹)		HcT (%)		RBC count (million mm ⁻³)	PT ^{''}		PTT ^{''}	
	12-16*	<12	40-45*	<40	4.6	11-13*	>13	34-45*	>45
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male (%)	13(34.54)	30(46.15)	20(38.4)	50(64.1)	25(43.10)	20(35.7)	38(52.1)	25(47.1)	28(52.8)
Female (%)	31(46.96)	35(53.84)	9(13.4)	28(35.8)	33(56.90)	24(38.0)	35(48.0)	42(63.6)	29(55.8)
Total	54(45.4)	65(54.70)	41(34.5)	78(65.6)	58(43.73)	46(38.7)	73(61.4)	67(56.3)	52(43.7)

*: Normal range

PTT test was abnormal in 43.7% of scorpion stung people. These patients had abnormal hemoglobin equal to 54.7% and the rest of patients had normal Hb range. So, we witnessed a significant difference in Hb in these two groups (p<0.001).

Analyzing of number of RBC count in stung patients showed that the number of these cells in 48.73% of scorpion stung was lower than 4.6 million mm⁻³, meanwhile the number of these cells in 61 scorpion stung persons (51.26%) were in normal range.

In the Southern west of the country, Khuzestan is one area where many scorpion species are habituated. One of the species which has been found rarely in the world is *Hemiscorpius lepturus* (*Gadim*) which is the most dangerous species in the world and it cause mortality. In this study incidence of scorpion stinging was in ages 20-29 years old with the rate of 36.13%. This rate is decreased by increasing of age, so the least rate (2.52%) was between 60-70 years old in our study. It may be likely due to the point that young people are work in city in potential areas such as old deserted buildings or they work in villages or farms and moving rocks, clods and soil which are the places of living scorpion and this makes them in risk of scorpion stinging. In relation to sex, we found that scorpion stinging is more prevalent in females with rate of 19.32%. However, in controversy to our findings, other studies in Brazil and Saudi Arabia showed that males are more affected by scorpion stinging has (Lira-da-Silva and Amorim, 2000; Neale, 1990). The reason of high percentage of female scorpion stinging in this study may be due to their house keeping affairs such as cleaning the carpets and also to work in farms.

Considering the hematological parameters changes, there was a rate of 48.73% erythrocyte hemolysis due to action of scorpion poison. As we mentioned earlier, scorpion Buthidae family, causes the decrease in some coagulation factors in animals too (Murthy and

Zolfagharian, 1986a, b). Due to this change, decreased level of Hb with rate of 54.7% was seen in the present study.

Increasing changes in PT (61.4%), was in agreement to other studies showing that scorpion poison can change PT factors (Murthy and Zara, 2001; Murthy and Zolfagharian, 1986a).

The changes of Hb, RBC and PT were considered as indexes for Gadim stung diagnosis. The subject helps us to consider the probable changes on bilirubin rate of the patients as well, because it is expected that by increasing hemolysis of the erythrocytes, the amount of bilirubin will be increased. In 50.42% of persons who were stung by scorpion, hemoglobinuria was observed.

The majority of patients (61.66%) showed hemoglobinuria which was severe. The reason was high level of hemolysis of the erythrocytes, because of Gadim,s poison which was confirmed by the other researchers (Shahbazzadeh *et al.*, 2007). The presence of hematuria in stung patients shows the effect of scorpion poison on kidney tissue and damage to capillary system of glomeruli.

Prompt treatment of scorpion stinging will be important for decreasing mortality. More studies are needed to investigate of the effects of scorpion venom on the other tissues and cells.

In conclusion, the results of this work have been explained on the basis of damages to structures such as erythrocytes, coagulation factors and capillary system of glomeruli.

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